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# WHO CONQUERED THE NEW WORLD? OR FOUR CENTURIES OF EXPLORATION IN AN INDEHISCENT CAPSULE

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## ABSTRACT

We track botanical conquest from Oviedo (who met Columbus in 1490 and visited Santa Marta, present Colombia, in 1515) to the corporate botanical garden at the close of the 19th century. We also recognize the foreign correspondent of the 16th century; the solitary missionary-naturalist of the 17th century; the apologist of systems (who advocates schemes of classification) in the 18th century; and the naturalist-collector, then often a member of a government-sponsored expedition in the 19th century.

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History? We are making history. Plant taxonomy is not a purely descriptive science, it is history, deviously directed toward a conclusion. History rests on archives of two sorts: books published from archives, and plant mummies ticketed or labeled and entombed in herbaria. The conquest of the New World by the explorers who observed and reported begins with Columbus who met Oviedo two years before Columbus set sail. We headline the sixteenth century for its commentators on the plants observed; the seventeenth century by the missionaries who collected seeds and, now and then, specimens; the eighteenth century by apologists of systems, collecting exhibits to support their schemes; the nineteenth century by the field collector-explorer who filled, not cabinets of curiosities, but museums which by the twentieth century would overflow.

Floras, faunas, history, everything flows, *omnia fleurit*. When did the sea bean, *Entada gigas*, first take the Gulf Stream across the Atlantic? The soft pithlike wood of *cuipo* or quipo (*Cavanillesia platanifolia*), a relative of *ceiba*, for centuries had been washed on the Azores by tempests. Indeed, these waifs were gathering evidence for what in Columbus's day was still looked upon as shoreless seas.<sup>2</sup> When he was coasting among the Bahamas on the first of his four voyages, Columbus wrote: "I believe there are many plants and many trees which are worth a lot in Spain for dyes, and for medicines and spicery; but I do not recognize them, which gives me great grief."<sup>3</sup> Pineapple as a domesticate from the Mosquito Coast was described, for example, by Columbus's son Ferdinand as a

"great pine cone; and the plant is grown in large fields [in Veragua, Panama] from shoots that grow out of the same piña [and] plants last for three or four years, always producing fruit."<sup>4</sup> (See Fig. 1.)

Pineapple was transplanted by Guaranies of south Brazil and Paraguay—the word *Ananas* is a Tupi-Guarani name—via other Amerindians probably down the Orinoco avenue of penetration to the Caribbean. The Portuguese had delivered it as far as Goa on the Indian Ocean during the sixteenth century. But pineapple was not the staple food that maize was, "the most important of all foods for men and their livestock."<sup>5</sup> By the late sixteenth century the peoples of central Africa were raising maize, manioc, peanuts, and squashes, all American domesticates, but we do not know exactly who those phyto-conquestadors were, who delivered the foodstuffs, or how early they arrived. So disproportionate was the west-to-east movement that Vavilov listed 640 New World plant domesticates but only 50 of African origins.<sup>6</sup>

Weeds from tropical or warmer climates had arrived in the Mediterranean from even before the days of Marco Polo, and these Old World emigrants arrived in Hispaniola in 1494 on the 17 ships of Columbus's second voyage. (Do you remember the *Santa María*, *Pinta*, and *Niña* from your school-book history days? The *Niña* returned to Hispaniola in 1494.) On board were 1,200 men (no women) taken abroad to build the settlement near Isabela.<sup>7</sup> Imagine the weed seeds that arrived when rootcrowns of the grape vines and sugar cane from Spain and her possessions were planted.

*Bixa*, the body paint of jungle Indians, in mod-

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FIGURE 1. Pineapple grown and illustrated in 1697 at the botanic garden in Amsterdam. This drawing served as a basionym in the description of the pineapple by Linnaeus in the *Species Plantarum* in 1753.

ern times has been sublimated into coloring for cheese and margarine. In 1526 Oviedo said the Caribs “paint their bodies [and] make themselves hideous [with] various figures on their faces and other parts of the body [thinking] they look good in it, and besides they like the appearance of the paint.”<sup>8</sup> Gaspard Bauhin cited Oviedo, and from the dehiscent capsule of *annatto* placed it in the generic group, *Castanea*.<sup>9</sup> When Linnaeus named *Bixa orellana* he commemorated Francisco Orellana, taking his flag from Plukenet who had pictured *Bixa* by its other name *achiote*.<sup>10</sup> Alexander Smith, employed in the Economic Museum at Kew, contributed to the *Treasury of Botany* of Lindley and Moore. Smith wrote that *Bixa* paint [was] almost their only article of clothing.<sup>11</sup> Perhaps *Bixa* gave the designation “Red Man.”

Tidings were circulated in Pizarro’s time that a sort of cinnamon grew on the east slope of the northern Andes. “The Land of Cinnamon” was placed as east of Quito, and Orellana was dispatched to accompany Francisco Pizarro’s brother Gonzalo on an expedition to a province called *Qui-*

*jos* to find this “*Canella alba*” or “*Ispingo*.” Gonzalo Pizarro chronicled that when they were “on the skirts of a volcano,” evidently *Cayambe*, it did not cease to rain for a single day for two months. He said the Spanish “received great injury, and much of their clothing became rotten.” In the vicinity of Sumaco the Indians went naked, Pizarro concluding, “they go naked because the country is so hot, and it rains so much that clothes become rotten.”<sup>12</sup> No specimens from this Spanish Pizarro period exist. It was probably Joseph de Jussieu who in 1747 first collected a sterile specimen that Lamarck labeled *Laurus quixos* and preserved in the Paris herbarium.<sup>12a</sup> Here at the Missouri Botanical Garden, Henk van de Werff is piecing together this complex history four centuries after Pizarro.

Although Santa Catalina Island was discovered off the southern California coast in October 1542 by Cabrillo, there was no botanist aboard the *San Salvador* or its consort, *La Victoria*, and it was 300 years before William Gambel botanized on the island in 1847.<sup>13</sup> The University of Padua, not Cabrillo’s Spain, opened the first botanic garden in Europe nearly a half century after Columbus.<sup>14</sup> The next botanic gardens, Leyden (1590) and Montpellier (1592), featured materia medica exhibits or plants involved in the economy of the nation. American plants were grown at Oxford, which opened its garden in 1621, Paris in 1635, and Uppsala in 1655. The great surge of living collections advanced with Kew in 1759 and her 13 satellite gardens throughout the far-flung British Empire. In due course there was a particular one outside the British crown—Shaw’s Garden, created in the image of Kew.

The growth of botany, systematic botany in particular, depends on the comparative forms of flowers afforded in a botanic garden. Just as vegetation types are mapped by so-called indicator species, botanic gardens stake the growth of horticulture and advance taxonomy. Notable are the Chinese studies nurtured by Arnold Arboretum’s Chinese plantings.

We recall that Mexico City and Lima opened universities in 1553 and 1555, and that the New World’s first herbal, though not published for four centuries, dates from 1552. It is the *Badianus Manuscript*.<sup>15</sup> This Aztec herbal records such modern concepts as the relation of hummingbirds to the tubular scarlet flowers of, for example, *Loeselia coccinea* (Polemoniaceae). There are puzzles: the aroid *huacalxochitel*, meaning “basket flower,” was illustrated for its value in curing angina. Tom Croat tells me it is “presumably a fanciful rendition



of some *Philodendron*." The tendrils in the drawing are unnatural; a few aroids do have lobed leaves, but none has blades close to those pictured. Many narrow-endemic philodendrons occur in Mexico, and so, in twentieth century thinking, "perhaps it represents an extinct species." Among other engaging illustrations in the *Badianus Manuscript* are the very earliest illustrations of American cacti, a cereoid and an opuntia.<sup>16</sup> Remarkably this 1552 herbal offers notes on Old World immigrants: *Rumex*, *Oxalis*, and *Cynara cardunculus*. Early records of New World *Parthenium hysterophorus*, and such fruits as mombin (*Spondias purpurea* L.) are in this Mexican herbal.

The Franciscan friar André Thevet was on the coast of Brazil in November 1555.<sup>17</sup> Later he sailed along the Florida coast and reached the Gulf of St. Lawrence. Thevet's Canadian journal was cited by Linnaeus in his *Bibliotheca botanica* (1747), where it was the first of what Linnaeus listed as "pereginationes Americani." Thevet antedated Jacob Cornut's Canadian account by 78 years, but Cornut offered about 30 plant descriptions. The indehiscent capsules of the attractive genus *Thevetia* bring him to mind. (The *Flora of Panama* describes these distinctive fruits as "drupes.")<sup>18</sup> A century before Linnaeus<sup>19</sup> "Ahovay" was included by Gaspard Bauhin in his *Pinax* under "Pomiferae Arbores" together with genipat and durion. Under a six-word polynomial Bauhin cited Jean de Lery, Protestant pastor who visited Brazil the year after Thevet, and who noted the fruit of Ahovay (*Thevetia*) as a *crepitaculum*, Latin for rattle. Domestic uses of plants are the first chronicled by the sixteenth century herbalists Clusius and L'Obel. The Tupinambas of Brazil wore *Thevetia* "shells" as anklets in their dances. When the barber-surgeon John Gerard produced his *Herball* or *Generall Historie of Plantes* for British readers, the year Shakespeare's "Henry the IV" was on the stage, Gerard figured a woodcut of *Thevetia*, the "Indian Morrice bells," in an allusion to the exotic Morocco dance theme. He said their "rattling sound doth much delight" the Indians.<sup>20</sup>

Only one of the several herbalists of the sixteenth century included American discoveries, so slow was the spread of plant lore. Brunfels included no American headlines, not even holy wood, *Guaiacum officinale* or *sanctum*, the prized antisphyilitic, which by 1530 was selling briskly. Fuchs alone of the herbalists illustrated two New World squashes and maize.<sup>21</sup> By 1583 Clusius of Antwerp, who profited from his residence in a port city on the North Sea, mentioned the "White beans of Guatemala" and "dama de noche."<sup>22</sup>



FIGURE 2. Pepper Tree of Chile illustrated by Feuillee in 1714, introduced into California during the Mission Period.

Before we leave the foreign correspondents of the sixteenth century, a word about Old World preconceptions that have left us with some everyday misnomers. For centuries maize was known as Turkey wheat, the American bison is still called buffalo, and the (spotted) jaguar, the Tupi Guarani name, has prestigious advertising value, nevertheless, the Old World association, *el tigre*, is the popular Latin American name today. When the American agave was named it became the "American aloe." David Quinn called these "products of wishful thinking."<sup>23</sup> The Greek word for a spiny plant is *kaktos*, appropriated for the cactus. John Lindley knew our avocado as Alligator pear, "pear" going back to Oviedo from its shape.<sup>24</sup>

Who were the solitary missionary-naturalists of the seventeenth century? First let us mention John Banister of the York River region of Virginia.<sup>25</sup> Had the Reverend Banister lived beyond his 38 years, North American natural history would have taken a very different course indeed. Banister took his M.A. degree at Oxford in 1674 and became clerk and chaplain at Magdalene College. He studied and collected especially the surviving plants brought back from the York River area that had



earlier been noticed by John Tradescant between 1632 and 1654. From 1678 to 1692, when Banister was accidentally shot while collecting on the Roanoke River, two-thirds to three-quarters of the plants described by Banister from Virginia were new. Leonard Plukenet had 89 of Banister's drawings finely engraved and reproduced in his *Phytographia*, with the Latin descriptions. However, he failed to credit Banister with 11 of these, mostly those received in England after Banister's death. Plukenet's Banister records were an important contribution to the writings of Linnaeus 50 years later. When Linnaeus quoted Gronovius or the works of Ray, Morison, Plukenet, Petiver, and Dillenius for records of Virginia plants, he was quoting Banister and was basing his newly described species on one of Banister's drawings or descriptions, although Linnaeus rarely attributed these to him. The monk Louis Feuillée (1660–1732) explored Martinique, Caracas, and elsewhere before visiting the coasts of Chile and Peru between 1707 and 1712, observing especially the ports of Concepción, Talcahuano, Coquimbo, and Callao. Linnaeus cited plants from the illustrated journal of Feuillée, but no specimens are known. The pepper tree, so well known in southern California, was cited from Feuillée as *Schinus molle* where the trivial epithet is without meaning, a mistake for *mulli*, the native vernacular name in Chile.<sup>26</sup> (See Fig. 2.)

The Catholic missionary Charles Plumier (1646–1704) visited Martinique and Haiti in 1689 with Joseph Donat Surian, physician-pharmacist.<sup>27</sup> Surian returned to France the next year with a plant collection, which is preserved in ten books in the natural history museum in Paris. Instead of collecting plants Plumier made about 6,000 line drawings and prepared early descriptions of the plants observed. These were the bases of four botanical works published between 1693 and 1760. They were completed by Johannes Burman who wrote the later descriptions.

The eighteenth century may be marked by the advocates or apologists for the two historic systems of plant classification launched in that century. The Sexual System espoused by Linnaeus, and its impact, has been skillfully told by Frans Stafleu in his *Linnaeus and the Linnaeans* (1971), with some references to the succeeding scheme, the emerging Natural System of Jussieu. I summarized in my "Plant Collectors in America: Backgrounds for Linnaeus" in 1970,<sup>28</sup> but we await a capsulated review of the American collectors and sources that contributed to Jussieu's natural arrangement.

Linnaeus is well known for his *Systema Naturae* published in 1735. The same year a clockmaker

in England, John Harrison, invented the first chronometer to enable ships to determine longitude at sea. The use of the chronometer was opposed by the astronomer royal, Nevil Maskelyne, and so it was not used on the *Endeavour* by Captain Cook. It became crucial in later voyages.<sup>29</sup> The chronometer and the sextant enabled expeditions to reach and to map charted shores accurately. The harvest of those expeditions would still be sorted by the numbers of their stamens and pistils into new genera and species according to Linnaean classes.

The description and classification of new plants in the New World followed in the wake of such applied botanical activities as the culturing of silkworms on leaves of mulberry trees. The founding of the Colony of Georgia is said to have rested on three needs: an asylum for debtors and persecuted Protestants; a trial garden for the growing of silk, wine grapes, and drug plants; and a relief of population pressures in the Old World.<sup>30</sup> Old Ebenezer, a sterile and unattractive spot about 21 miles from Savannah and about four miles below the present town of Springfield, Effingham County, was settled in the spring of 1734 by 78 Salzbergers. George Genzmer described them as "simple folk, pious, industrious, uneducated, impoverished by confiscation and exile, and bewildered by their situation on the Georgia frontier." Baron von Reck and Reverend Johann Bolzius led a "tour of observation into the adjoining country [to Savannah] sponsored by Governor Oglethorpe."<sup>31</sup> Old Ebenezer had proved unsatisfactory—in 1736 the settlers moved to a high ridge and founded New Ebenezer. Central to my mentioning Ebenezer is the appearance in 1756 of an almost entirely overlooked botanical paper published in *Hamburgisches Magazin* enumerating 87 plants, mostly economic or potentially useful species: the report of the Reverend Bolzius.<sup>32</sup>

Dr. William Houstoun botanized in the West Indies, Vera Cruz, and the Spanish Main on behalf of Sir Hans Sloane and the Chelsea Physick Garden.<sup>33</sup> His premature death in Jamaica, August 14, 1733, brought an end to the plan of Oglethorpe and the South Sea Company, by whom Houstoun was retained as a physician, for shipping plants and seeds from tropical America to West Indian ports, to Charleston, and to the "Colony of Georgia in America." Some West Indian plants reached the Savannah plantations from Houstoun's travels.<sup>34</sup> His energies in other regions and the many new species he discovered and made known by Philip Miller indicate that the history of Georgia botany would have been very different had he lived.

Men of the nineteenth century at watersheds around the world who directed the flow of knowl-



edge from explorations included Barton, Humboldt, the Hookers, the de Candolles, Martius, Engler, Torrey, and Gray. Humboldt's enquiry into many fields is "unlikely ever to be surpassed, for thoroughness, perseverance, curiosity, courage, and sheer force of intellect."<sup>35</sup> Humboldt's was the last moment in history when an individual could master all branches of science. William Jackson Hooker, as did S. F. Baird in this country, implemented the field naturalists, often out of their own pockets, to assemble at Kew the records of global exploration. Witness, for example, that George Gardner, M.D., aided by Hooker, from 1836 to 1841 wrote 36 letters, some 18 and 24 pages long. Gardner's comments in his *Brazilian Travels* (1846) are often to the point: the Rio botanic garden, Gardner wrote, is "more a promenade than a Botanic Garden."<sup>36</sup> Joseph Dalton Hooker, who cultivated Kew after his father's seeding, saw the international values of colonial floras, still of first-line usefulness, for the West Indies, Hongkong, British India, and so forth. The elder de Candolle, Augustus Pyramus de Candolle, first used "endemique" in 1820.<sup>37</sup> His *Prodromus*, published from 1823 to 1873, with his son, Alphonse, involved British and continental authors. "Prodromus literally means the northeast wind which blows for eight days before the rising of the dogstar," wrote Willis Linn Jepson. "The work was intended as a forerunner of that natural system which would sometime appear in effulgent glory. . . . The Prodromus blew for fifty years but the dogstar has not yet risen."<sup>38</sup>

Geopolitics dictates exploration. Banks and Solander were not welcomed when they visited Rio de Janeiro in 1769, and later Humboldt was forbidden to enter Brazil, then in tight control of Portugal. But Napoleon's invasion of Spain in 1807 set off independence movements in America. The tables turned in Portugal. Many left Lisbon for an emergent Brazil. The capital was moved from Bahia to Rio de Janeiro in 1808; Brazil was opened to English commerce, and the botanic garden was founded in that same year. For the succeeding decades a veritable parade of field-collecting explorers from Europe went to Brazil. Included were Langsdorff, Sellow, Saint-Hilaire, Pohl, Claussen, d'Urville, Mawe, Bowie, Burchell, Cunningham, and many more, a parade unmatched perhaps in the annals of botanical exploration.<sup>39</sup> The sixth German naturalist in the decade was Karl Friedrich Philip von Martius, born in Erlangen, northern Bavaria. Martius was joined by the zoologist Johann Baptist von Spix.<sup>40</sup> They traveled 1,400 miles from 1817 until 1820, on an expedition "that certainly ranks among the most important enterprises un-

dertaken for scientific purposes in the [nineteenth] century." As many as 6,500 plant specimens, as well as living plants and seeds were sent to Munich. Zoological collections included 85 mammals, 350 birds, 116 fishes, and 2,700 insects. Seeded by the plant collections was the epic *Flora Brasiliensis*. Martius, then of age 46, prompted by the ill-fated Endlicher, in 1840 launched the first of 130 fascicles, which in 20,733 pages made 15 volumes. Martius completed 46 fascicles by his death in 1868. A. W. Eichler and Ignatz Urban continued to edit the *Flora* to its completion in 1906. Sixty five botanists of nine European nations contributed their accounts to *Flora Brasiliensis*.<sup>41</sup>

It may surprise us to read Asa Gray's letter to George Engelmann in 1863 that "Martius is not a very remarkable botanist, but good." Gray then added Martius "is a genial, philosophical soul (full of Plato, etc.), a good explorer, has worked up the Palms, etc., and is a wonderful man for the amount he knows on a vast number of different subjects—philology, antiquities, philosophy, *et id genus omne*."<sup>42</sup> Gray had first met Martius on his European tour in 1839—Gray was 28, Martius, 45, "a small man, not so tall as I" says Gray, "quite thin, but very good looking."<sup>43</sup> They met at the Royal Cabinet in Munich, once a Jesuit College, then containing the immense library, which according to Gray was one of the two largest in the world, though the collections except for the Brazilian plants "make no great show after that of Vienna." After his visit to the botanic garden, Gray dined at the "house of Martius," met his "very intelligent and pleasant" wife, and their four children. The party then retired to the royal chapel, listened to the chapel musician on the piano "play to perfection," then, says Gray, to crown all, Martius seized his fiddle, quite to my surprise, and played with great spirit."<sup>44</sup>

For the Brazil of Spix and Martius that will never return, listen to their "first night in the open air" not far from Rio:

At Retiro, a miserable fazenda, lying sideways from S. Marcos, in a narrow swampy valley, surrounded by woody mountains, we passed the first night in the open air. The uraponga had ceased his strangely sounding notes, the swarms of grasshoppers commenced, as night set in, their monotonous chirp, at intervals interrupted by the notes of a large frog, resembling a drum, the lament of the capueira, and the dull cry of the goatsucker. Affected by the constantly returning impressions, we felt ourselves in a strange and solemn mood in the lonely wilderness, which was further increased when the filament, with all the splendour of the southern constellations, beamed on the dark forest, and millions of shining beetles fluttered in luminous circles through the



hedges, till at length a heavy rain veiled all in darkness.

The next mountains over which we passed are lower, and rise at intervals. The road is sometimes cut very deep in the soil, which consists of red clay, is very narrow, and when two troops of mules meet, as it often happens, dangerous. This kind of road is, however, welcome in luxurious forests, because confining all travellers to one narrow path, prevents it from being quickly overgrown, as would otherwise happen.<sup>45</sup>

No single botanist in this country accomplished so much in the Nineteenth Century to create the image of American botany as did Asa Gray. John Torrey, botanist, chemist, and mineralogist, differed from Gray, though they had characteristics in common. Both had a deeply religious turn of mind, although I have always suspected that Asa Gray attended Church as a proper Bostonian, whereas Torrey, a more retiring Christian, seldom mentioned his religious associations. Both took medical degrees, and both preferred the magnifying lens to the stethoscope.<sup>46</sup>

John Torrey wrote to Professor A. P. de Candolle at Geneva on January 6, 1837, "whenever I can find time I continue to work on my *Florae Americae Septentrionalis* on which I have been engaged for several years past. We are now doing much in N. America to perfect the Flora of our country." At this time he was expecting Gray to join the Wilkes Exploring Expedition. "Dr. Gray who has worked by my side for nearly three years past, is to be the botanist. He is well qualified for the situation. . . . The United States can well afford to send out this expedition as we have 50 millions of dollars in our treasury and have paid all our debts. I hope we shall yet have a national botanic garden. . . ."<sup>47</sup> Gray, however, declined, and together they proceeded with the *Flora*.

The *Flora of North America* was planned, fostered, and stands today as Torrey's monument, which Gray helped to raise. Gray worked hand in glove with Torrey, as Bentham and Hooker worked across the Atlantic. Gray's trip to Europe in 1838 was the first trip of an American botanist to visit European museums expressly to study type specimens essential to the writing of a flora.

By 1867 Asa Gray had many loyal followers with an almost idolatrous devotion. Frequent references in letters between botanists to "the Good Doctor Gray" attest to the fraternity of spirit. Gray had created a garden, a garden of living and dried plants, and by this time a garden of memories. It may fairly be said that he had even built an empire. To summarize Torrey's influence: he contributed to a sound taxonomy of the Cyperaceae; he fostered

the work of many botanists including one, Rafinesque, with whom he disagreed; he wrote an exemplary pioneer state flora; and he prepared many descriptions of new species for the government-sponsored Mexican Boundary Survey and the Pacific Railway Reports. Torrey was 55 when they were begun.<sup>48</sup>

Asa Gray was a man of sound scholarship, broad culture, and of compelling personality, yet he was jealous of his preeminence. Alphonso Wood, with neither the talents nor the advantages of Gray, competed successfully in the textbook field.<sup>49</sup> The first edition of Wood's *Class Book of Botany* (1845) promptly sold out, the second edition and subsequent printings from stereotyped plates held their popularity. All the while the author was traveling and learning new floras. He made a major revision in 1861, and others followed throughout his lifetime. Altogether between 800,000 and one million copies of Wood's botanies were sold. Henry Nicholas Bolander, author of a catalogue of limited popularity on the plants of San Francisco area (1870), wrote enviously to Asa Gray in 1866, "What is to be done with Professor Wood?"<sup>50</sup>

Columbus Ohio bryologist Leo Lesquereux wrote to Professor Bolander in 1864 about an endemic feature of California: "We were greatly concerned about your shocks of earthquake and happy to know that you had escaped a living burial or something of that sorte."<sup>51</sup>

Who conquered the New World? For the naturalist there was no real conquest, only a quest. And the search continues. In 1841 George Bentham named the genus of plants *Heliampora* based on Schomburgk's collection from Roraima. Today nine heliamphoras are known from the Guayana Shield.<sup>52</sup> The pigeonholes of this garden's herbarium hold verified undescribed taxa.

What of those "indehiscent capsules"? I taught plant taxonomy at Tulane, disseminating the definition that a capsule was dehiscent except when it was indehiscent, for example, in the Brazil nut. The American naturalist Herbert Huntington Smith wrote of the "nut-capsules . . . five inches in diameter and weighing two or three pounds; falling a hundred feet or more, they come crashing through the branches like cannon balls, and bury themselves often six inches deep in the ground. You can imagine," said Herbert Smith, "that a man's skull would be small proof against such a missile."<sup>53</sup> He had gone to Brazil at age 19 with his Cornell professor, C. F. Hartt, in 1870 and later collected off and on until 1902 in South America, Mexico, and the West Indies. In 1910 Smith became curator of the Alabama Museum of Natural History. Deafness



overtook him in time, and as he was walking on March 22, 1919 along a railroad track he failed to hear an approaching locomotive.<sup>54</sup> To get back to one of those indehiscent capsules, the poet Catullus in the first century BC wrote about what he called a "little chest"; he called it a *capsula* with no mention of indehiscence. John Lindley, master lexicographer, stressed the splitting in 1830, just as Leeuwehoek in 1693 wrote of the "capsula breaking upon the ripening of the seed."<sup>55</sup>

Who really knows who conquered America? Can we encapsulate the story indehiscently? Definitions flow. *Omnia fleurit*. The pictures drawn of Barro do Rio Negro by Wallace and Spruce are different from the Manaus I saw in 1985. How long will the New World remain "new"? Capsules generally crack open, but what about the lecyths? They rot. Time is short and the water rises. Unfortunately one lifetime seems hardly enough to allow a scholar full mastery of every aspect of huge subjects like these. Peter Gayl, Dutch historian said: "History is an endless debate and he who delights in debates with historians enjoys the spice of historical writing." But, as Samuel Johnson said, "I may freely, without shame, leave some obscurities to happier industry, or future information."

#### NOTES

2. Samuel Eliot Morison, *Admiral of the Ocean Sea: a Life of Christopher Columbus* (Boston, Little Brown, 1942) 2 volumes. 1: 60. One volume edition (1942) lacks the chapter notes.
3. *Ibid.* 1: 325.
4. Quoted in Carl O. Sauer, *Early Spanish Main* (Berkeley, Univ. California, 1966), 133. Morison, 2: 70, see map with dates following p. 68. J. Ewan, "The Columbian discoveries and the growth of botanical ideas with special reference to the Sixteenth Century" in *First Images of America. The Impact of the New World on the Old*, Fredi Chiappelli, editor (Berkeley, Univ. California, 1976), 807-812. References on pineapple, 812, note 14. Recent accounts: Francisco Oliva-Esteva and Julian A. Steyermark, *Bromeliaceae of Venezuela, Native and Cultivated* (Caracas, Armitano, 1987), 100-101; Freddy Leal, "On the history, origin and taxonomy of the pineapple," *Interciencia* 14 (1989), 235-241.
5. Alfred W. Crosby, Jr., *Columbian Exchange. Biological and Cultural Consequences of 1492* (Westport, Connecticut, Greenwood, 1972), 171, 192.
6. *Ibid.*, 1985.
7. Morison, 2: 102-116.
8. Sterling A. Stoudemire, editor, *Oviedo's Natural History of the West Indies, 1526* (Chapel Hill, Univ. North Carolina Studies Romance Languages and Literatures, 1959), 33. Amerindians used three body paints: red, from *bija* or *urucú* or *achiote* with variant spellings, the fruit of *Bixa*; bluish black, from *jagua*, or *genip*, *genipapi*, or *jenipapeiro*, *Genipa americana* L.; yellow, from bark of *Bixa*. See *Handbook of South American Indians*, Julian H. Steward, editor, (Bur. Amer. Ethnol. Bull. 143, 1948). 7 volumes.
9. Diagnostic phrase-names of Bauhin: *Arbor Mexicana fructu castaneae coccifera*. *Pinax* (1671), 419.
10. Leonard Plukenet, *Almagestum botanicum* (London, 1696), 272. pl. 209, fig. 4.
11. A(lexander) S(mith) in John Lindley and Thomas Moore, *Treasury of Botany*, revised edition (London, Longmans, Green, 1889), 148.
12. Clements R. Markham, *Expeditions into the Valley of the Amazons, 1539, 1540, 1639* (London, Hakluyt Soc., 1859), 6-7.
- 12a. For Joseph de Jussieu in Ecuador see Arthur B. Steele, *Flowers for the King* (Durham, North Carolina, Duke Univ., 1964), 20-22; Frans Stafleu, *Linnaeus and the Linnaeans* (Utrecht Intern. Assoc. Plant Taxonomists, 1971), 278-279. For Jussieu's association with Lamarck see Ludwig Diels, "Beiträge zur Kenntnis der Vegetation und Flora von Ecuador," *Bibliotheca Botanica* 116, (Stuttgart, 1937), 48.
13. J. Ewan, "Early History" in J. Ewan, editor, *Short History of Botany in the United States* (New York, Hafner, 1969), 28. Nuttall commemorated Gambel in 1848 as *Gambelia speciosa* from his Santa Catalina collection made in February, 1847, but now = *Galvezia speciosa* (Nutt.) A. Gray. Witmer Stone, "Philadelphia to the coast in early days, and the development of western ornithology prior to 1850" *Condor* 18 (1916): 3-14. pp. 11-12. T. S. Palmer, "Notes on persons whose names appear in the nomenclature of California birds" *Condor* 30 (1928): 261-307, p. 278. Howard Campbell, "William Gambel, Naturalist" *New Mexico Wildlife* 26(6) (Nov.-Dec. 1978): 2-9, mentions Gambel's passing through St. Louis in April-May 1841, enroute to Independence, Missouri, but his diary (if any) is lost.
14. J. Ewan, "Notable living collections and botanic gardens" in Ian MacPhail, *Hortus Botanicus, the Botanic Garden and the Book* (Lisle, Illinois, Morton Arboretum, 1972), 118-119.
15. Emily W. Emmart, *Badianus Manuscript* (Baltimore, Johns Hopkins Univ., 1940). Martin de la Cruz, author of the Aztec text, latinized by Juannes Badianus. Pl. 20, p. 224, is *Datura meteloides* DC., not *D. arborea* L. Pl. 30, p. 234, *Philodendron* is perhaps *P. pseudoradianatum* Matuda but "not very close," not *Xanthosoma* fide Thomas Croat (pers. comm.).
16. John M. Fogg, Jr., "Two early cactus pictures," *Cactus and Succulent Jour.* 52 (1980): 267.
17. André Thevet, *Les Singularitez de la France antarctique* (Paris, 1558), Paul Gaffarel, annotated edition, 1878. P. Fournier, "au Bresil. André Thevet, cordelier," *Les Voyageurs naturalistes du clerge français avant la Revolution* (Paris, Lechevalier, 1932), 11-21.
18. *Annals Missouri Bot. Garden* 57 (1970): 92.
19. The widely cultivated, New World, narrow-leaved, showy-flowered *Thevetia peruviana* (Pers.) K. Schum. was one of three components of *Cerbera* in Linnaeus, *Sp. Pl.* (1753), 208-209. The second New World ovate-leaved "yoyote" or "yoyotl" is now *T. ahouai* (L.) A. DC. Linnaeus adopted the Indian name given



- in Thevet's *Singularitez de la antarctique la France* (1588), 66. The third, Old World *Cerbera manghas* L., is now understood to comprise three elements, according to Herbert Huber in M. D. Dassanayake and F. R. Fosberg, *Flora of Ceylon* (Washington and New Delhi, 1983) 4: 53, 54. Such involved histories of Linnaean species are not unusual.
20. John Gerard, *Herball* (London, 1633, Johnson "emaculata" ed.), pp. 1545-1546.
  21. Crosby, 177. See note 4. See also J. J. Finan, "Maize in the great herbals," *Annals Missouri Bot. Garden* 35 (1948) 149-191.
  22. Joseph Ewan, "The Columbian discoveries and the growth of botanical ideas with special reference to the sixteenth century" in *First Images of America*, edited by Fredi Chiappelli (Berkeley, California, Univ. California Press, 1976), 2: 807-812, n. 4.
  23. David Beers Quinn, "New geographical horizons: Literature" in Chiappelli, 635-658, Pp. 637-638.
  24. Stoudemire, 86-87. See note 7.
  25. J. & N. Ewan, *John Banister and his Natural History of Virginia, 1678-1692* (Urbana, Illinois, 1970).
  26. Feuillée's diagnostic phrase name, *Mulli foliis non serratis*, appears under *Schinus areira* L., *Sp. pl.* 389, characterized by entire leaflets, the usual variant noticed in California. The *Botanical Magazine* pl. 3339 (1834), drawn from a greenhouse plant with serrated leaflets, is the Linnaean *S. molle*. Feuillée's works were noticed by J. Ewan in *Herbarist* 25 (1959), 60-64, and in *Amer. Fern Jour.* 50 (1960): 26-32.
  27. J. Ewan, "Plant collectors in America: backgrounds for Linnaeus" in *Essays in Biohistory* (Utrecht, Regnum Veg. 71. 1970) 22, 50. Fournier, 53-59 (see note 16). Typification problems reviewed by W. T. Gillis and W. T. Stearn, *Taxon* 23 (1974): 188-190. I. Urban, *Symbolae antillanae* (Berlin, 1898) 3: 62.
  28. See note 26.
  29. J. C. Beaglehole, *Exploration of the Pacific* (London, A. & C. Black, 1934, 3rd edition. 1966) and *Life of Captain James Cook* (Stanford Univ. Press, 1974), *passim*.
  30. J. Ewan, "Silk culture in the colonies, with particular reference to the Ebenezer colony and the first local flora of Georgia" *Agric. Hist.* 43 (1969): 129-141.
  31. Kristian Hvidt, *Von Reck's Voyage. Drawings and Journal of Philip Georg Friederich von Reck* (Savannah, Ga., Beehive Press, 1980), esp. 7-25. P. A. Strobel, *Salzburgers and other Descendants* (Baltimore, 1855, reprint, Athens, Georgia, 1953), 90-124. Pastor Henry Melchior Muhlenberg, mentioned as a visitor, not to be confused with botanist Rev. Henry Ernest Muhlenberg, who did not visit Georgia.
  32. Ewan (1970), 140-141. See note 29.
  33. J. E. Dandy, *Sloane Herbarium* (London, British Mus. (Nat. Hist.) 1958), 139-140. Urban, 3: 62. See note 26.
  34. Ewan (1969), 44-47. See note 29.
  35. Robin Furneaux, *The Amazon* (London, H. Hamilton, 1971), 97.
  36. Hooker correspondence, volume 68, Royal Botanic Garden, Kew. G. Gardner, *Travels in the Interior of Brazil . . . 1836-1841* (London, Reeve, 1846), 34. Portuguese edition, (São Paulo, 1975), 31.
  37. *Dict. des Sci. Naturelles* (1820) 18: 412.
  38. W. L. Jepson, *High School Flora for California* (Berkeley, Assoc. Students, 1935), 6.
  39. F. W. Pennell, "Historical sketch," in F. Verdoorn, *Plants and Plant Sciences in Latin America* (Waltham, Massachusetts, Chronica Botanica, 1945), 35-48.
  40. Nelson Papavero, *Essays on the History of Neotropical Dipterology* (São Paulo, Univ., 1971) 1: 65-69.
  41. I. Urban in G. F. P. von Martius, *Flora brasiliensis* (1906) 1 (Pt. I): 210-228.
  42. Jane Loring Gray, editor, *Letters of Asa Gray* (Boston, Houghton-Mifflin, 1893) 2: 215.
  43. *Ibid.* 1: 232-233.
  44. *Ibid.* 1: 234.
  45. J. B. von Spix & C. F. P. von Martius, *Travels in Brazil in the Years 1817-1820*. (London, Longman, etc., 1824) 1: 284-285.
  46. J. Ewan, "Only ten feet less" in J. E. Gunckel, *Current Topics in Plant Science* (New York, Academic Press, 1969), 155-160.
  47. J. Torrey, Jan. 6, 1837, to A. P. de Candolle, Archives, Conservatoire Jardin Botanique Genève.
  48. See I. M. Johnston, *Jour. Arnold Arbor.* 24 (1943): 237-242.
  49. Publications of Alphonso Wood, 1810-1881, listed in *Agric. Library Notes* (1927) 2: 95-100. Charles J. Lyon, "A 50 Edition Best Seller" *Dartmouth Alumni Mag.* 31 (March 1939), 18, 81-83.
  50. J. Ewan (1969), 44. See note 12.
  51. Leo Lesquereux, Columbus, Ohio, 13 April 1864, to H. N. Bolander. Bolander papers, Bancroft Library, Univ. California, Berkeley.
  52. Julian Steyermark, *Annals Missouri Bot. Garden* 71 (1984): 302.
  53. Herbert H. Smith, *Brazil. The Amazon and the Coast* (New York, Scribners, 1879), 311. Jean de Laet described the tree, called *totocke* in *Novus Orbis* (1640), 632. Humboldt praised de Laet's "remarkable description," see Ewan (1976), 812 and note 3. *Bertholletia* fruits are "functionally indehiscent" fall to the ground, the seeds held inside by the smallness of the opercular opening or "plug" until the agoutis gnaw open the fruits, eat a few seeds, i.e. the "Brazil nuts," disperse others which may eventually germinate. See Scott A. Mori & G. T. Prance, Chapter 6 in R. E. Dickinson, editor, *Geophysiology of Amazonia* (New York, Wiley, 1987), 69-89.
  54. T. S. Palmer, *Auk* (1920): 637-638.
  55. Anton von Leeuwenhoek, *Phil. Trans.* 17 (1693): 706.